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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/631,805	08/03/2000	Rajiv Laroia	20-6	9145

7590

01/09/2004

Ryan & Mason LLP
90 Forest Avenue
Locust Valley, NY 11560

EXAMINER

MERID, ARADOM B

ART UNIT	PAPER NUMBER
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2631

DATE MAILED: 01/09/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/631,805

Applicant(s)

LAROIA ET AL.

Examiner

Aradom B. Merid

Art Unit

2631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 15-20 is/are rejected.
- 7) ☒ Claim(s) 6-14 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim1-5 and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kesh et al. in Spatial Acquisition of Wideband Frequency-Hopping Signals Using Adaptive Array Processing , IEEE 1988.

In Regard to claims 1 and 15-20, Kesh et al. discuss the adaptation of an array antenna with M number of elements(antennas) to a plurality of K-dimensional frequency hopped incident signals by estimating the spatial covariance (autocorrelation) matrix of the received signals as discussed on page 0376, left column and as shown in equation (3a). The spatial covariance matrix equation(3a) contains a matrix of a noise variance indicating an interference matrix. The discussion on the Development of The Algorithm on page 0376 and 0377 also teach how the interference matrix is being generated from the spatial covariance matrix of the incident signals (also see equation (8) and the paragraph following the equation on page 0377).

Kesh et al. discuss the processing of the antenna gain as an array response of the interference signal received denoted by noise subspace vector \mathbf{W} with the antenna gain satisfying the linear combination of the interference signals according to equation (4). Kesh et al. further discuss applying appropriate weight vector to the received signals to form an array output for signal detection of the transmitted signal (page 0376, right col., lines 10-27, and page 0376, left col. Lines 23-30 and equation(2)). Referring to claim 2, the method discussed above uses frequency hopping system in which the frequencies are hopped in every specified amount of time is the same as orthogonal frequencies division multiplexed with spread spectrum multiple access as explained in the specification on page 2, line 19-25.

In reference to claims 3 and 4, Kesh et al. teach that the antenna array has M antenna elements and the spatial autocorrelation matrix (covariance matrix) \mathbf{R} according to the equation (3a) is an $M \times M$ matrix (see equation(3a) and page 0376, left col.) . And the antenna gain response mentioned above is scaled array vector according to the direction of arrival of the signals as described by equation (4) and the discussion in the paragraphs below and above the equation (also see page 0376 and 0377).

Referring to claim 5, Kesh et al. teach the autocorrelation (spatial covariance) matrix \mathbf{R} of the received signal is determined based upon estimation of the matrix \mathbf{R} and updating the estimate with new

measurements(page 0376, right col.) . This implies the interference array which is generated from the matrix R includes the steps of selecting initial estimates and subsequently applying a designated number of iterations to get the final estimate.

Although Kesh et al. do not specifically refer to a base station associated with a cell of cellular wireless (or mobile stations) communication systems as mentioned in the claim limitations of claim 1-5 and 15-20, one of ordinary skill in the art clearly recognizes that the communication system of array antenna of M elements processor and the plurality of K-dimensional frequency hopped incident signals referred in the Kesh et al. teachings have the same applications and purposes as the base station with array of antenna and a cell of frequency hopped cellular wireless system. Therefore, it would have been obvious to a person having an ordinary skill in the art to apply the above method in a communication system that involve a base station having an array antenna and mobile stations associated with the base station.

Allowable Subject Matter

Claim 6-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The following references are cited when prosecuting this office action because they discuss relevant issues to the claims.

U.S. Patents Documents

Raleigh	U.S. Patent Number: 6,006,110
Yukitomo et al.	U.S. Patent Number: 6,240,149
Kuwahara et al.	U.S. Patent Number: 6,647,276
Kobayakawa et al.	U.S. Patent Number: 6,064,338
Ishii et al.	U.S. Patent Number: 6,509,872
Kamia et al.	U.S. Patent Number: 5,854,612

Foreign Patent Documents

Wells	GB 2265053A
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Non-Patent Documents

Torrieri et al., An Anticipative Adaptive Array For Frequency Hopping Communications, July, 1988, IEEE, Vol. 24, No. 4, pages 449-456.

Bakhru et al., The Maximin Algorithm for Adaptive Arrays and Frequency-Hopping Communications, Sept., 1984, IEEE, Vol. AP-32, No. 9, pages 919-928.

Hugl et al., Downlink Beamforming for Frequency Division Duplex Systems, 1999, IEEE, Globecom '99, pages 2097-2101.

Eken, Use of Antenna Nulling With Frequency-Hopping Against Follower Jammer, Sept., 1991, IEEE, Vol. 39 No. 9, Pages 1391-1997.

Kim et al., Adaptive BeamForming For An OFDM System, 1999, IEEE, Pages 484-488

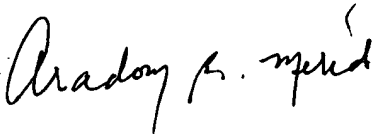
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aradom B. Merid whose telephone number is 703-305-8953. The examiner can normally be reached on 8:00am-5:00pm (Mon. - Fri.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 703-306-3034. The fax phone number for the organization where this application or proceeding is assigned is 703-308-9051 .

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Aradom B. Merid




MOHAMMAD H. GHAYOUR
PRIMARY EXAMINER